

AMENDMENTS TO THE CLAIMS

1. (Original) A method for forming metal deposits on a substrate comprising:
 - a) depositing a photosensitive organometallic compound onto a substrate;
 - b) irradiating the photosensitive organometallic compound with UV radiation;
 - c) reducing the irradiated photosensitive organometallic compound to form metal deposits adhered to the substrate; and
 - d) removing any degraded photosensitive organometallic compound residue and unaffected photosensitive organometallic compound from said substrate.
2. (Original) A method for forming metal deposits on a substrate according to claim 1 wherein the reduction process in step c) comprises:
 - 1) a first heating and cooling stage;
 - 2) a second heating and cooling stage in an oxidising atmosphere;
 - 3) flowing an inert gas over the substrate; and
 - 4) a third heating and cooling stage wherein a reducing gas flows over the substrate to form metal deposits.
3. (Currently Amended) A method for forming metal deposits on a substrate according to ~~any of claims 1 or 2~~ claim 1 wherein the metal deposits are of ~~any shape or configuration such as a substantially continuous thin 'sheet-like' film or a substantially narrow line of nanometre dimensions~~ configuration.

4. (Currently Amended) A method for forming metal deposits on a substrate according to ~~any preceding~~ claim 1 wherein metal lines of less than 70 nm are formed on the substrate.

5. (Currently Amended) A method for forming metal deposits on a substrate according to ~~any of claims 2 to 4~~ claim 2 wherein the first heating and cooling stage are in an inert atmosphere such as a noble gas, e.g. dinitrogen.

6. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any of claims 2 to 5~~ claim 2 wherein the ~~second heating and cooling stage is performed in~~ oxidizing atmosphere comprises a dioxygen containing atmosphere such as air.

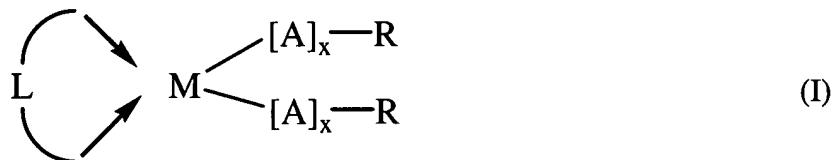
7. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any of claims 2 to 6~~ claim 2 wherein the reducing gas in the third heating and cooling stage comprises at least dihydrogen.

8. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any preceding~~ claim 1 wherein the photosensitive organometallic compound is a platinum organometallic.

9. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any of claims 1 to 7~~ claim 1 wherein the photosensitive organometallic compound

~~contains any of the following metals~~ comprises a metal chosen from the group of: palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum.

10. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any of claims 1 to 7~~ claim 1 wherein the photosensitive organometallic compounds formula (I) as described below:



wherein:

M is any a member of the group consisting of platinum, palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum;

A is any of oxygen, sulphur, an amide grouping, an amine grouping or an ester grouping;

x is 0 or 1;

R is a fluoroorgano group; and

L is a bidentate ligand.

11. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any of claims 1 to 7~~ claim 1 wherein the photosensitive organometallic compounds are selected from any of the following the group consisting of: bis-(perfluoropropyl)-1,5-cyclooctadiene platinum (II); bis-(perfluoropropyl)-1-methyl-1,5-cyclooctadiene platinum (II); and bis-(perfluoropropyl)-1-fluoromethyl-1,5-cyclooctadiene platinum (II).

12. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any preceding~~ claim 1 wherein the organometallic compound is deposited using ~~any of the following~~ a method from the group consisting of: a vacuum coating technique, a spinning technique, a surface tension coating technique or a hot spray technique.

13. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any preceding~~ claim 1 wherein a thin film of about 100mg of photosensitive organometallic is deposited onto a substrate.

14. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any preceding~~ claim 1 wherein the UV radiation has a wavelength of about 260nm.

15. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any preceding~~ claim 1, wherein the reduction process reducing step comprises:

- (1) heating the coated substrate from about 25°C to about 120°C at a ramp rate of about 2°C per minute; maintaining the temperature at about 80°C for about 60 minutes; and then cooling the substrate from about 80°C to about 25°C at a ramp rate of about 10°C per minute; wherein N₂ is flowed over the coated substrate at a rate of about 50ml per minute;
- (2) heating the substrate from about 25°C to about 250°C at a ramp rate of about 5°C per minute; maintaining the temperature at about 250°C for about 60 minutes; and then cooling the substrate from about 250°C to about 25°C at a ramp rate of about 5°C per minute; wherein the coated substrate is exposed to air;

- (3) flowing N₂ at about 25°C over the coated substrate for about 10 minutes; and
- (4) heating the coated substrate from about 25°C to 25 about 350°C for about 60 minutes; and then cooling the substrate from about 350°C to about 25°C at a rate of about 20°C per minute; wherein a mixture of about 5% H₂ and 95% N₂ is flowed over the coated substrate at a rate of about 150ml per minute.

16. (Currently Amended) A method of forming metal deposits on a substrate according to ~~any of claims 1 to 14~~ claim 1 wherein the reduction process comprises:

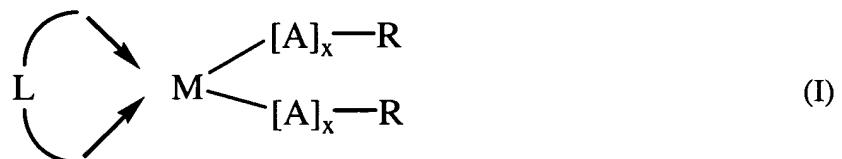
- 1) heating the coated substrate from about 25°C to about 120°C at a ramp rate of about 2°C per minute; maintaining the temperature at about 80°C for about 60 minutes; and then cooling the substrate from about 80°C to about 25°C at a ramp rate of about 10°C per minute; wherein N₂ is flowed over the coated substrate at a rate of about 50ml per minute;
- 2) heating of the substrate from about 25°C to about 350°C at a ramp rate of about 20°C per minute; maintaining the temperature at about 350°C for about 60 minutes; and then cooling the substrate from about 350°C to about 25°C at a ramp rate of about 20°C per minute; wherein the coated substrate is exposed to air;
- 3) flowing N₂ at about 25°C over the coated substrate for about 10 minutes; and
- 4) heating the coated substrate from about 25°C to about 350°C at a ramp rate of about 20°C per minute; maintaining the temperature at about 350°C for about 60 minutes; and then cooling the substrate from about 350°C to about 25°C at a rate of about 20°C per minute; wherein a mixture of about 5% H₂ and 95% N₂ is flowed over the coated substrate at a rate of about 150ml per minute.

17. (Currently Amended) Metal deposits formed according to ~~any of claims 1 to 16~~ claim 1.

18. (Original) Metal deposits according to claim 17 wherein the metal deposits have a width of about 60nm to 20nm.

19. (Currently Amended) Metal deposits according to ~~any of claims 17 and 18~~ claim 17 wherein the metal deposits have a thickness of about 5nm to 20nm.

20. (Original) Compounds according to the following formula (I):



wherein:

M is any of platinum, palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum;

A is any of oxygen, sulphur, an amide grouping, an amine grouping or an ester grouping;

x is 0 or 1;

R is a fluoroorgano group; and

L is a bidentate ligand.

21. (Original) Compounds according to claim 20 wherein A is oxygen.

22. (Currently Amended) Compounds according to ~~any of claims 20 and 21~~ claim 20 wherein x is 0.

23. (Currently Amended) Compounds according to ~~any of claims 20 to 22~~ claim 20 wherein the fluoroorgano group is selected from any fluoro derivatives of the following group consisting of: a C₁₋₁₂ alkyl, a C₁₋₁₂ alkenyl, a C₁₋₁₂ alkynyl or a C₁₋₁₂ aryl grouping which are substituted or unsubstituted and/or linear or branched.

24. (Currently Amended) Compounds according to ~~any of claims 20 to 22~~ claim 20 wherein the fluoroorgano group is selected from any fluoro derivatives of the following: a C₁₋₄ alkyl, a C₁₋₄ alkenyl, a C₁₋₄ alkynyl or a C₁₋₄ aryl grouping which are substituted or unsubstituted or linear or branched.

25. (Currently Amended) Compounds according to ~~any of claims 20 to 24~~ claim 20 wherein the bidentate ligand comprises two olefin groups, and as such may be 1,5-cyclooctadiene or derivatives of thereof such as 1-methyl-1,5-cyclooctadiene and 1-fluoromethyl-1,5-cyclooctadiene.

26. (Currently Amended) Compounds according to ~~any of claims 20 to 24~~ claim 20 wherein the bidentate ligand is cyclooctatetraene or derivatives thereof.

27. (Original) Compounds according to claim 20 wherein the compounds are bis-substituted (perfluoroorgano) cyclooctadiene platinum (II) compounds.

28. (Currently Amended) Compounds according to claim 20 wherein the compounds are selected from ~~any of the following~~ the group consisting of: bis-(perfluoropropyl)-1,5-cyclooctadiene platinum (II); bis-(perfluoropropyl)-1-methyl-1,5-cyclooctadiene platinum (II); and bis-(perfluoropropyl)-1-fluoromethyl-1,5-cyclooctadiene platinum (II).

29. (Currently Amended) A process for forming compounds according to ~~any of claims 20 to 28~~ claim 20 comprising forming a reaction mixture of:

a) compounds according to formula (II) as shown below:



wherein:

M is any a metal of the group consisting of platinum, palladium, copper, rhodium, tungsten, iridium, silver, gold and tantalum;

L is a bidentate ligand; and

Z is an organo grouping;

and

b) compounds defined as follows according to formula (III):



wherein:

h is a halide;

A is any of oxygen, sulphur, an amide grouping, an amine grouping or an ester grouping;

x is 0 or 1; and

R is a fluoroorgano grouping;

and subjecting the reaction mixture to conditions such that compounds according to formula (I) are formed.

30. (Original) A process according to claim 29 wherein the mixing of the reaction mixture is performed under darkness or in ambient conditions.

31. (Currently Amended) A process according to ~~any of claims 29 or 30~~ claim 29 wherein the compound shown by formula (II) is in a solvent.

32. (Currently Amended) A process according to ~~any of claims 29 to 31~~ claim 29 wherein the compound shown by formula (I) is obtained by filtering off the precipitate and evaporating off any remaining solvent or any other volatile substances.

33. (Original) A process according to claim 32 wherein the obtained precipitate is purified by redissolving the obtained precipitate in a solvent and running the obtained solution

down a chromatographic column and collecting the fraction containing the purified compound of formula (I) and then crystallising the collected fraction from, for example, a solution of methylene chloride/pentane solution.

34. (Currently Amended) A process according to ~~any of claims 29 to 33~~ claim 29 wherein the compound shown by formula (III) is selected from ~~any of the following~~ a member of the group consisting of: perfluoroorgano-iodide, perfluoroorgano-bromide, perfluoroorgano-chloride and perfluoroorgano-fluoride.

35. (Currently Amended) A process according to ~~any of claims 29 to 34~~ claim 29 wherein the organo group of the fluoroorgano group in formula (II) or formula (III) is selected from ~~any of the following~~ the group consisting of: a C₁₋₁₂ alkenyl, a C₁₋₁₂ alkynyl, a C₁₋₁₂ alkynyl or a C₁₋₁₂ aryl grouping which is substituted or unsubstituted and/or linear or branched.

36. (Currently Amended) A process according to ~~any of claims 29 to 34~~ claim 29 wherein the organo group of the group in formula (II) or formula (III) is selected from ~~any of the following~~ the group consisting of: a C₁₋₄ alkyl, a C₁₋₄ alkenyl, a C₁₋₄ alkynyl or a C₁₋₄ aryl grouping which is substituted or unsubstituted or linear or branched.

37. (Currently Amended) A process according to ~~any of claims 29 to 36~~ claim 29 wherein the compound shown by formula (III) is selected from ~~any of the following~~ the group consisting of: n-perfluoropropyl iodide; and perfluorobutyl iodide.

38. (Currently Amended) A process according to ~~any of claims 29 to 37~~ claim 29 wherein the mixing of the reaction mixture takes place under an inert atmosphere and comprises shaking for five days.

39. (Currently Amended) A process according to ~~any of claims 29 to 38~~ claim 29 wherein the compound shown by formula (II) is a bis-substituted organo platinum (II) cyclooctadiene compound.

40. (Currently Amended) A process according to ~~any of claims 29 to 39~~ claim 29 wherein the compound formed according to formula (I) is selected from ~~any of the following the~~ group consisting of: bis-(perfluoropropyl)-1,5-cyclooctadiene platinum (II); bis(perfluoropropyl)-1-methyl-1,5-cyclooctadiene platinum (II); and bis-(perfluoropropyl)-1-fluoromethyl-1,5-cyclooctadiene platinum (II).

41. (New) A method for forming metal deposits on a substrate according to claim 1 wherein the metal deposits are of a configuration of a substantially narrow line of nanometer dimensions.

42. (New) A method for forming metal deposits on a substrate according to claim 5 wherein the noble gas is dinitrogen.